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movement". The specific meaning of 'nationality' or of 'that particular person' was usually carried by eye-kinaesthesia; a movement of the eyes in the direction of the country or of the place associated to the particular person. Visual imagery served in making more concrete the nature of the fitting person.

We conclude that in the case of this 'highly responsive observer' the sound of the word is a determinant of the 'most fitting person' in about 30% of the cases, and that on the whole the correspondence of his responses to the same name is considerably more than chance would allow. The characterization of the fitting person is usually preceded by a meaning of an attitudinal sort which points toward or in the direction of the fitting person, and the characterization itself may be regarded as an explication of this meaning. Kinaesthetic and organic sensations are reported as the correlates of the meaning, and verbal and visual processes carry the more concrete meanings which present themselves in the course of the explication.

XXXVI. THE PSYCHOLOGICAL BASIS OF APPETITE

By E. G. BORING and AMY LUCE

The psychological establishment of hunger as a kinaesthetic complex of pressure and pain and its physiological ascription to certain 'hunger-contractions' of the stomach¹ led the early investigators to distinguish hunger from appetite, which was used as a term to denote a desire for food, occurring in the absence of sensory, muscularly conditioned, stomachic hunger.² Since the taking of food in the early part of a meal inhibits hunger-contractions and the correlated hunger-sensations, the desire for food which persists to the dessert can not be hunger and has been put forward as the type of appetite. There are various ways in which this desire might be psychologically mediated: the appetite-meaning might consist of an attitude toward food, as would be the case if it consisted merely of a sensorimotor disposition to take and eat food; or it might be carried by specific ideas which involve a food-reference; or it might reduce to a particular pattern of sensations or a particular quality of sensation which, as pattern or quality, is itself appetite.³ We should have, in the first case, an action-consciousness and, in the second case, an ideational consciousness, of which neither would be psychologically peculiar; appetite would then possess individuality of meaning but not of mental process or pattern. In the third case we should have a truly psychological distinction. It is some such sensory account of appetite that Carlson appears to imply when he states on the basis of experimental work, that "the gastric mucosa is

¹ A. J. Carlson has summarized this experimental work in *The Control of Hunger in Health and Disease*, 1916; see esp. pp. 16-83.

² W. B. Cannon and A. L. Washburn, *An Explanation of Hunger*, *Amer. J. Physiol.*, 29, 1912, 441; Carlson, *The Relation between the Contractions of the Empty Stomach and the Sensations of Hunger*, *ibid.*, 31, 1913, 185ff.

³ *Locc. cit.*; E. G. Boring, *Processes Referred to the Alimentary and Urinary Tracts: A Qualitative Analysis*, *Psychol. Rev.*, 22, 1915, 315f.

endowed with a protopathic sensibility" which constitutes a "gastric component of the sensation of appetite."⁴

Carlson puts forward a specific method for obtaining these gastric sensations of appetite and for distinguishing them from hunger. "Moderately cold water, beer, wine, weak acids (0.5 per cent) or weak alcohol" introduced into the stomach through a stomach-tube "give rise to a characteristic sensation which fuses with, or cannot be distinguished from appetite." "By introducing these substances through the stomach tube at the height of a gastric hunger contraction one actually experiences a *successive contrast of the sensations of hunger and appetite*, as these substances temporarily inhibit the hunger contractions in stimulating the gastric mucosa. . . . From the first it was clear that, when beer, cold or hot water, were introduced into the stomach during a vigorous hunger contraction, the sensation resulting was the exact opposite of that caused by the hunger contraction. In place of an unpleasant, tense sensation, associated with restlessness, the sensation caused by these different stimuli is one of relief. A pleasant tingling sensation is felt in the stomach. One feels perfectly at ease, but the thoughts tend to revert to the dinner table. At first he [Braafladt] was not able to say just what this sensation was like, although it was a familiar one. After paying close attention to the sensation experienced at meals just after a few mouthfuls of food or drink have been swallowed, he became convinced that the two sensations are very much alike if not identical."⁵

Carlson writes as a physiologist and goes no farther than to set the psychological problem. He tells us that appetite is, in part, sensory, but he does not tell us whether the appetite sensation is a unique quality, or a unique spatial, temporal, or intensive pattern of familiar qualities, or simply a distinct meaning which occurs without psychological uniqueness.⁶ It was our intention in this study to apply Carlson's method and to obtain a psychological description of the experience which he has called appetite.

Initial Experiments with Carlson's Method. Through one of our stomach-tubes (outside diam., 9 mm.; lumen, 6 mm.) we passed a much smaller tube (outside diam., 4 mm.; lumen, 2 mm.), which projected a few mm. beyond the larger tube and bore on its end a rubber balloon. When this rubber balloon was inflated in the stomach and the external end of the small tube connected to a tambour, we could record stomachic contractions upon a kymograph. The large tube at

⁴ Carlson and L. H. Braafladt, On the Sensibility of the Gastric Mucosa, *Amer. J. Physiol.*, 36, 1915, 162ff.; Carlson, *The Control of Hunger, etc.*, 96-118. The use of the term "protopathic" is, in this connection, peculiarly uncritical. Head, who invented the term, had nothing to say of appetite. These authors apparently accept Head's dictum that the internal organs do not mediate "epicritic" sensibility, a position which leads them into incompatibilities; see Boring, *Psychol. Bull.*, 14, 1917, 99. And why, furthermore, are we to bestow these newly discovered internal sensations upon "protopathic" rather than upon "deep sensibility"?

⁵ Carlson and Braafladt, 162f. The method was demonstrated before the American Biological Societies: Carlson, *Amer. J. Physiol.* 33, 1914, xv.

⁶ By the word "sensation" Carlson does not intend to imply psychological simplicity. For example, he uses "hunger sensation" and "hunger sensations" interchangeably (*Control of Hunger, etc.*, 62-71) and appears at the same time to admit the complexity of hunger (p. 26).

its outer end was attached to a device for introducing liquid stimuli⁷ under slight pressure; these stimuli could be passed to the stomach inside the large tube and outside the small tube, while the stomachic contractions were being recorded.

Our observers were Dr. E. G. Boring (Bo) and Mr. F. L. Dimmick (D), who had had previous practice in similar experiments,⁸ and Miss J. M. Gleason (G).

We had little difficulty with these observers in getting records of typical hunger-contractions with contemporary introspective accounts of the hunger-complex. We were thus assured of the familiarity of our observers with the introspective nature of hunger.

As stimuli we used 5% alcohol, 0.5% HCl, and beef tea. These solutions we introduced in varying amounts (50 cc. to 150 cc.) into the stomach at times when the kymograph tracing indicated strong hunger-contractions. The observers were instructed to give a description of all processes referred to the stomachic region.

This experiment failed of its original intention, because it brought out no organic experience contrasting with hunger or differing markedly from hunger. We did obtain descriptive norms for hunger. When the stimulus was introduced the hunger and the hunger-contractions were sometimes, although not invariably, inhibited. When the hunger was inhibited, there seemed to follow no specific sensory pattern; there was nothing which could be called appetite. All that was left were weak, vague pressures and pains, which passed at times gradually over into a mild hunger. The following reports are typical:

Bo. "Hunger was inhibited suddenly. Then for a moment it was just pressures. Then cold in stomach and throat. Then hunger back again. Then a vague small hard little ache, which seems static for a moment and then begins to fade and fluctuate and spread, and finally turns into a real hunger ache."

D. "The burny pains of hunger left; other pressures stayed. And the gnawing thing went. Later the bright, burny thing came back, after the tube was out, and was more diffuse."

G. "Had heavy pressure [=hunger]. When alcohol entered, the pressure left. Cool in larynx and at place almost to sternum. Then gradually hunger came back very slowly."

On the nature of hunger as a complex of pressure and pain,⁹ we may note these reports:

D. "Characteristic thing about hunger is a little bright burny thing at the base of the stomach. It is a pain, although it would not ordinarily be called so. There are other diffuse pressures mixed with this." "I have a painy thing that comes and goes. It comes slowly, welling up, then dies out quickly. That is the central part of hunger. This pain is a funny sort of burny thing."

G. "Hunger is just a pressure, constant, which varies in intensity and is very profuse. And there is a pain which is the same as the pain in extreme pressure. This dull pain comes sometimes for fifteen or thirty seconds."

Bo was familiar with hunger as a complex of kinaesthetic pressure and pain on the basis of other experiments,¹⁰ and did not attempt to describe it separately at this time.

⁷ *Amer. J. Psychol.*, 26, 1915, 8f. and Fig. 1.

⁸ *Ibid.*, pp. 5-55, 485-494; *Psychol. Rev.*, 22, 1915, 307-330.

⁹ Boring, *Psychol. Rev.*, 22, 314f.

¹⁰ *Loc. cit.*

Experimental Meals with a Group of Observers. Our failure to find appetite with Carlson's method led us to look for it under the more normal conditions of the meal.

We began with group meals; for these we added to the three observers already mentioned four others: Mr. H. G. Bishop (Bi.), Mr. C. N. Clark (C), Mr. G. J. Rich (R),—all graduate students,—and Miss A. Luce (L). Every observer was given a note-book in which to write his reports.

In the first experiment these general instructions were given: "Whenever instructed to do so, you are to make in this note-book a report in writing, which shall involve the following points: (1) Are you hungry now? (2) Do you feel any desire for food other than hunger? (3) If you do not have a desire for food in general, do you feel a desire for any particular kind of food? (4) Give a description of any sensory complexes (organic 'feelings') which appear to come from your alimentary canal (mouth, throat, oesophagus, stomach), including any sensations involved in hunger or 'desire for food.'" By these instructions we hoped to bring out appetite, and to get it described in relation to hunger, without directly suggesting Carlson's conclusion to our observers.

The observers were asked under these instructions to write an initial report. Then steaming soup was brought into the room and the odor allowed to diffuse, so that hunger might be accentuated, and a second report was called for. Then the observers ate a few crackers to inhibit the hunger and reported a third time. Then they were told to eat soup and bread "until you have had enough." When they indicated that they had had sufficient soup, crackers and cheese, olives, Nabiscos, and peppermints were set before them, and they were told: "Pick out some article of food which you would like to eat now. Before you eat it, compare your feelings when contemplating eating it with your feeling when contemplating eating more soup, and report on these feelings according to the general instruction."

The results of this experiment indicated that the observers could be trusted to select their own times for reporting, and that they needed to be encouraged to report meanings as well as to describe sensations. Accordingly, for the second experimental meal we used the following instruction: "You are to write in this book successive reports which shall deal with the 'attitudes' and mental processes immediately involved in eating this meal. You should report all *attitudes* or *meanings* that pertain to food-taking (e.g., hunger, desire for food, revulsion, etc.) and all *mental processes* (particularly those sensations which are referred to the mouth, throat, oesophagus, and stomach) which underlie these 'attitudes' or meanings. You are to make a report whenever there is a marked change in the 'attitude' or in the sensory complex referred to the alimentary canal. It is suggested that you will probably wish to make *at least* three reports: one before the meal, one after taking a little food, and one toward the end of the meal."

We may note in the first place that our observers had no difficulty in differentiating between hunger and the 'desire for food' or appetite.

Bi. "Hunger has a keen edge of abdominal pressure. Appetite loses the unpleasant accompaniment of hunger. Instead of the pressure and pain of hunger there is a squirming light pressure in the pit of the stomach and increased salivation."

Bo. "Hunger is a dull, slowly fluctuating ache in the stomach region. Appetite is a tactual sensitiveness of my mouth and to a less extent of my oesophagus. Partly mouth watering." "My alimentary canal is 'alive', especially achy (not hunger) near my stomach, and pressury

in my mouth (saliva).” “The big outstanding thing to my ‘appetite’ is a stomach-ache. It is more lively, of less body, and more easily localized and attended to than is the hunger-ache.”

C, although possessing normally a strong appetite, was rarely hungry.

D. “The desire for food is continuous and is therefore something in addition to the sensory thing I call hunger. Hunger is a vague mixture of pressures and a peculiar sort of ‘pain’ in the region of the stomach.” “After eating a few crackers, there was a lull in the hunger sensations, but the desire for food was still present. This desire is a rich complex, and consists largely of mouth and nose components with ever changing visual imagery.”

G. “In my stomach a dull extended muscular pressure means hunger; whereas dryness and warmth in my mouth and throat (except when my mouth waters as it does when I get images of food) mean ‘desire for food.’”

L. “Appetite is like hunger, but is more mild. It is a very diffuse ache in the region below the sternum.” “When I think of eating the mint my mouth has a peculiar tactual sensation and waters somewhat.”

R. “Hunger consists of an achy pressure. . . . After taking a few crackers, this pressure-ache tends to disappear and to become spasmodic. Just below it in the body there appears a light tingling pressure. . . . When contemplating olives, I desire to eat them, and I find a faint tingling in the pit of the stomach. The pressures seem to fade out of consciousness while the tingling sensation comes to the front.”

We conclude that appetite is not hunger. It may be differentiated from hunger by the nature of certain stomachic sensory components (Bi, Bo, L, R) or by the presence of oral sensory factors (Bi, Bo, D, G, L) or by imagery (D, G). R makes the distinction in terms of stomachic sensations alone; Bi, Bo, and L refer to both the stomachic and oral factors; D and G assign the difference to the oral sensations *plus* their imaginal supplementation.

Already, then, we are gaining a hint of the real nature of appetite. Appetite may involve (a) stomachic sensations, (b) oral sensations, (c) imagery, and, as we shall see later, (d) general bodily attitudes or dispositions. Let us take these components up in order.

(a) Bi, Bo, C, L, and R report *stomachic* components in appetite.

Besides Bi’s report (quoted above) of “a squirming light pressure in the pit of the stomach”, he tells at another time of “a heightening of a sinking pressure pain in the region of the stomach”, which means appetite. Again: “I get a sort of squirming pressure in the pit of the stomach; it is a light, bright, half-pleasant experience.”

Bo gives several reports consistent with those quoted above, which characterized appetite as a ‘lively’ ‘stomach-ache’, ‘of less body, and more easily localized and attended to than is the hunger-ache.’ For example: “Hunger is gone. There is still an ache in the stomach, but it is almost constant, not so lively, nor so penetrating.” And, moreover, appetite “is pleasant, while hunger tends to be unpleasant.”

C speaks of a “stomachic sensation of warmth” involved in the desire for food.

We have quoted L’s mention of a diffuse stomachic ache, milder than hunger, in appetite. This ache can not be wholly unlike hunger, for it is “a slight contraction-like feeling in the stomach, which fluctuates and is present when I attend to it.”

R is explicit in his reference to appetite as “a light, tingling pressure” (see above). This “tingling pressure is localized under the

point of the sternum and further down; it is rather broad and diffuse. I suppose I should simply call it a tingling."

(b) Bi, Bo, C, D, G, and L ascribe *oral* components to appetite.

Bi mentions 'mouth-feels' and the flow of saliva. "The feels in the mouth are heightened and the odor of the soup adds to the flow of saliva." "I have a slight flow of saliva as I anticipate the next spoonful."

We have quoted Bo on the "tactual sensitiveness" of mouth and oesophagus and on the salivary pressures in the mouth. Mentions of "mouth sensation including copious salivation" are repeated.

C reports: "At the presence of food, the secretion of saliva increased noticeably. There are sensations of pressure at the base of the tongue." "The appetite remaining seems to be the saliva flow and pressure sensations in the mouth and throat."

D calls the desire for food a "rich complex" which "consists largely of mouth and nose components;" "sniffing and mouth and throat sensations are most prominent."

G describes "dryness and warmth in my mouth and throat, except when my mouth waters. The warmth and dryness in my throat are urgent desire for food, relieved by the moistness." "Mouth waters. Passage seems clear to oesophagus, *i.e.*, relaxed." "With the thought of bread and butter, my mouth and throat seem relaxed and open, *i.e.*, free from strain and pressure."

L writes: "When I think of eating the mint, my mouth has a peculiar tactual sensation and waters somewhat. There is a tactual ache in the back of my throat. When I have a desire for more mint, my mouth waters."

(c) D and G, as we have seen, consider *imagery* relevant to appetite.

D reports both "visual imaginal complexes, accompanying" the oral sensations in appetite, and "kinaesthetic images of the puckery and cool feel" which eating olives would give.

G notes that "my mouth waters as I get images of food," and, more specifically, that "it is an image of coolness and smoothness which I get clearly now as I look at bread and butter."

(d) Bo and D point out that the desire for food may sometimes be more adequately described as *attitudinal* than as sensory.

Bo writes: "I do not want food violently, but when I think of my alimentary canal I can recognize the impulse for taking food,—a purely motor, determinative thing, that is like the impulse to drink when one is mildly thirsty."¹¹ "I have the impulse to take food when I think about it in purely kinaesthetic and 'habit' terms."

D says of appetite: "I discovered the dish of olives near by, wanted one, took it, and ate it. The reaching was almost reflex."

Individual Experimental Meals. The group-experiment does not provide the best introspective conditions. Accordingly, we sought to supplement the collective trials by sessions in which single observers dictated their reports to the experimenter. These experiments were made on Bo, D, and G, both when hungry and when replete. When hungry, the observers ate a few crackers to inhibit the hunger contractions. Then, in the presence of olives, or crackers, they were given the following instruction: "Take up an attitude of desiring something to eat. If you succeed in taking this attitude, give me as complete a psychological description of the attitude as you possibly can. Describe any sensations which may be relevant and also characterize the attitude in general terms."

¹¹ *Ibid.*, 310.

In these trials we find again that Bo reports a *gastric sensory component* of appetite and that D and G do not. It is true that G once mentions a stomachic pressure, but its description resembles hunger and its relevance is not explicitly stated. Bo's gastric appetite is not, however, hunger. It is a bright, lively ache, brighter and livelier than hunger, with a different temporal-spatial pattern from hunger (small, fixed, constantly persisting), and pleasant; "this pleasantness seems to hang right into the quality in just the way that the pleasantness in the ache of stretching does."

The *oral complexes* constitute the most generally recognized basis for the appetite-meaning. The three observers all make much of the sensations which result from increased salivation. They all also mention pressures and aches in the mouth and throat, similar to the sensory basis of thirst,¹² which mean desire for food. G also mentions coolness of the mouth. D and G imply kinaesthetic factors when they say that the movements of the tongue and jaws are free and easy; and G insists further that she feels her throat relaxed. Bo and D report sniffing, as if to inhale the odor of food.

Imagery is assigned a subordinate rôle. All three observers report it, but D now fails to find it relevant to appetite. Bo and G usually consider it as a condition for the increased salivation of appetite rather than as an intrinsic part of the appetite experience. Certain oral images may, however, be relevant. G reports "a taste image,—salt and olfactory;" Bo says, "When I desire the olives, I can image the pressure-pucker which I get with bitter olives." In any case, imagery is subordinate to the oral complex; either it conditions a factor in the oral complex or else it adds imaginarily another oral component.

The *kinaesthetic* factors already mentioned represent a deglutitory attitude. The sniffing, the freely moving mouth and tongue, the relaxed throat, all reflect a readiness for food. G speaks of "motor tendencies, which seem widespread in mouth and jaws." Bo and D extended this disposition to the whole body. Appetite was for them at times a reaching-for-food. D, for example, remarks: "The wanting of the cracker is an unconscious tendency to reach for it. The motor side is the first thing that comes." "The big part of appetite is that I can't keep my hand away from the cup. The whole thing is to move and get an olive." "Appetite is mostly a bodily attitude which involves getting and eating, i.e., the muscular side. Part of the time I feel myself reaching and then I see my hand going. That is *Kundgabe*, which means kinaesthetic feels in my arm. And I have kinaesthetic feels or imagery in my jaw and face, twitches which mean chewing, together with movement of the tongue."

Such reports bring us to a difficulty inherent in our problem. Appetite is a meaning; and, though meanings may be recognized and reported, they can not be described. Our observers had no difficulty in recognizing appetite; but they sought to describe it. If there had been some sensory quality which invariably carried the appetite-meaning, they would have doubtless hit upon this sensation as the essential feature in their description. But, Carlson to the contrary, there seems to be no sensory *sine qua non* of appetite. Thus our observers were forced for description to give various available processes which they regarded as relevant to the appetite-meaning. The question of relevance was not always easy for them to decide, and the attempt to make the decision led them often to a report of attitude and away from description. The following protocol of Bo illustrates the variety of reported factors,

¹² *Ibid.*, 310f.

the difficulty of determining their relevance to appetite, and the lapse from description to attitudinal report, in order adequately to account for the appetite-meaning:

"The prominent thing in this appetite is stomachic sensation. There is a more or less static fixed pressure-ache complex, in which the ache is not so dull as it is in hunger, which lacks the intermittence of hunger, and which penetrates into me more. This penetration is a sort of thrust-up, and perhaps arises because my attention tends to shift to my throat, just as is the case with the stomachic temperature sensations which I may localize either in stomach or throat. I don't entirely localize these pressure-aches in my throat, because when I attend to my throat the ache drops out; but the throat-pressure and the stomach-ache do seem to be related because attention shifts back and forth from one to the other so readily. I don't think that hunger leads to the throat in the same way. . . . Then there are also the pressure mouth sensations, involved in copious salivation; both the pressure under my tongue and the feel of the top of it are altered. . . . Both mouth and stomach complexes seem, under critical survey, to be nothing but sensations and scarcely to account for the desire for food. What happens is that, as I look at the crackers and work myself into the situation, sometimes the mouth sensations or more often the stomach sensations get clear, and then all at once I find myself incipiently moving to take a cracker. It seems as if either the stomach or the mouth could mean 'Take a cracker!', and that under the psychological attitude they turn into mere sensations, which are very different things from a desire. . . . As I sit here attending to my report, all at once the stomach thing wells up and gets to be nearly the whole of consciousness; it is immediately supplemented by an attitude of activity which means that I just want badly to pick up a cracker and eat it. If I let my mind dwell on picking up the cracker and eating it, my attention goes back to my mouth, and I find my mouth watering vigorously. The whole experience is analogous to being tickled under psychological conditions. The sensory content of tickle is just sensory content, and the squirming to get away seems perfectly unaccountable and mechanical. But at a commonsense level I feel as if the tickle caused the squirming."

Retrial of Carlson's Method. In our initial experiments with the stomach-tube we failed to find an appetite-sensation. In the experimental meals, however, five observers (Bi, Bo, C, L, and R) reported stomachic components of appetite, whereas only two observers (D and G) did not. It seemed reasonable, then, that we might succeed in isolating a stomachic component if we returned, after the introspective practice of the experimental meals, to the method of the stomach-tube. Since the balloon in the initial experiments had been uncomfortable, we abandoned it in these trials and therewith the record of gastric contraction. We worked with the three observers who had learned to swallow the tube, Bo, D, and G. Warm tomato soup had proved adequate to appetite in the experimental meals; we, therefore, employed it here, in doses of 400 and 200 cc., slowly administered through a funnel. The temperature was such that it gave rise to few thermal sensations. Repletion was produced by the larger dose, but not appreciably by the smaller. The sessions were held when the observers were hungry, and accounts of stomachic sensations, consisting principally of descriptions of hunger, were taken before the tube was introduced. The tube was swallowed to a point 30 cm. from the teeth.

The instruction, given after swallowing the tube, was as follows:

"Take note of the sensations or sensory complexes of stomachic origin which you now have. Then, when you are ready, signal to the experimenter for the stimulus. After the stimulus has been introduced, you are to note again the stomachic sensations or sensory complexes. When you are ready, remove the tube and give as completely as possible a description of the sensory material which you noted both before and after the stimulus."

In the first place, we may note that the introduction of the soup was followed for all observers by the cessation of hunger (inhibition of hunger-contractions, presumably), and that the disappearance of the hunger was followed for Bo and D and probably for G by a short period of 'blankness', during which there appeared to be no sensations referred to the stomach. Bo reports once, as the initial phase of the period, "Nothing;" and in another trial, "After the stimulus the stomachic sensations disappeared entirely. I was completely blank except for the throat sensations from the tube. After all the soup was in, I could still feel no properly stomachic sensation. I am very positive about this." D says: "The first thing I noticed was an absence of sensation as compared with the complex I had before;" "the region now is characterized by its blankness." G notes that "when the soup went in the muscular pain moved all around and then disappeared." We do not find, then, the "successive contrast of the sensations of hunger and appetite," which Carlson has led us to expect.

All observers reported an experience of 'fulness' or repletion, which occurred with the larger dose, and which they described in terms of pressure with sufficient accuracy to distinguish it from the complexes to which we must now turn our attention.

We have seen that under the appetite-situation of the experimental meals Bo tended to report stomachic components, and that D and G practically never did. A similar individual difference holds in these trials. Bo, following the period of 'blankness', finds the live, bright stomachic pressure-aches, which he had formerly designated as a component in appetite, and he is able, although with difficulty, still to attach the appetite-meaning to them. D and G, under these conditions, neither report appetite nor find the bright pressure-aches which somewhat resemble hunger; on the other hand, they are not entirely without stomachic sensations. After the lapse of the period of 'blankness', they find pressure-complexes recurring in the stomach, which indicate that the stimulus may be adequate to some sensation, even if not to the meaning of appetite. The pertinent quotations follow:

Bo: "After the blankness, a pressure-pain, like the hunger-complex, only less intense, not so big, more definitely localized, and of approximately constant intensity. I tried to ask myself whether this was appetite; it did not have the meaning of craving for food that hunger had. It was more a liveness of the stomach region, which means, 'I'd be glad to have more food'. . . . Later this pressure-ache again, on which I could put the appetite meaning voluntarily. . . . Altogether, however, these feelings do not take on gastronomic meanings readily. I could call this 'experimental appetite', meaning that it is not the prominent part of the usual appetite-experience."

D: "Now after the period of blankness I notice a lower pressure, a different pressure from those of hunger and of repletion, which is more superficial. . . . Later the pressures of the first part of the experiment have gone."

G: After the dying out of the hunger pains "I got a diffuse muscular pressure, much less intense than muscular pressure usually is. It seemed undulating and more intense at some times than at others. It

narrowed up. It did not change into pain at all. It persisted as diffuse pressure."

PSYCHOLOGICAL CLASSIFICATION OF THE PROCESSES WHICH CARRY
THE MEANING OF APPETITE

		1	2	3	4
		Sensory stomachic complex	Sensory oral complex	Imagery	Kinaesthesia of general bodily attitude
Regular	Bo	Yes	Yes	Sometimes	Yes
	D	Probably not	Yes	Rarely	Yes
Observers	G	Probably not	Yes	Sometimes	Yes
Occasional Observers	Bi	Yes	Yes
	C	Yes	Yes
	L	Yes	Yes
	R	Yes	Possibly

Conclusions. Appetite can be adequately described only as a food-seeking attitude or meaning, a reaching-out-after-food.

A psychological account of appetite attempts to describe the sensory processes correlated with this attitude. In the large they consist in the general kinaesthesia of the orientation of the organism toward food (muscular activity, automatic movement kinaesthetically sensed, *etc.*). The psychological content is as meagre with respect to the total meaning as is the bare content of typically attitudinal experiences like tickle¹³ and thirst.¹⁴ (See column 4 of Table.)

The most constant and characteristic feature of appetite is an oral, deglutitory attitude, which involves sniffing, free movement of the mouth and tongue, copious salivation, and relaxation of the throat.¹⁵ The corresponding sensory pattern is a predominantly kinaesthetic complex of pressures and aches, supplemented occasionally by warmth or cold, and reflecting in its specificity the oral attitude. Psychologically it resembles the sensory pattern of thirst,¹⁶ although markedly different in meaning. (See column 2 of Table.)

Imaginal processes are relevant only as they supply oral images or condition the salivary reflex.¹⁷ (See column 3 of Table.)

¹³ E. Murray, A Qualitative Analysis of Tickling, *Amer. J. Psychol.*, 19, 1908, 289, esp. 329f.

¹⁴ Boring, *Psychol. Rev.*, 22, 310f.

¹⁵ Possibly also initial movements of deglutition; *cf. ibid.*, 315.

¹⁶ *Ibid.*, 310f.

¹⁷ Cannon and Washburn, therefore, overestimate the importance of imagery in appetite; *loc. cit.*; Cannon, *Bodily Changes in Pain, Hunger, Fear, and Rage*, 1915, 233f.

Food in the stomach may give rise to sensations which do not constitute hunger. These sensations are described as bright, lively, tingling pressures or aches, which are pleasant, and, unlike hunger, static, definitely localized, and easily attended to. Some observers (D, G), however, do not have these sensations; with food in the stomach they report either no sensations at all or vague, indefinite pressures.

The bright, lively, tingling, stomachic complex fuses readily with the oral pattern in carrying the meaning of appetite (Bi, Bo, C, L). It is not, however, essential to the appetite-meaning (Bi, Bo, D, C, G, L), although one observer (R) found that, unsupported, it carried this meaning; and another observer (Bo), that the appetite-meaning could voluntarily, although with difficulty, be added to the isolated stomachic complex. Two observers (D, G) never based appetite upon stomachic sensations. (See column 1 of Table.)

It seems reasonable to suppose that this bright stomachic complex is the same as the "sensibility of the gastric mucosa" described by Carlson. In interpreting this pattern as an essential component of appetite, Carlson and Braafladt presumably put upon it their own individual meanings, which are, apparently, not completely in accord with those of other observers.

Against Carlson we would urge that the stomachic sensations are not always prominent, nor even always present, in appetite; that, when present, they frequently contribute but scantily; and that, when present in isolation, they often cannot mean appetite. It may be that appetite, as meaning, contrasts with hunger; with respect to stomachic sensory pattern, on the contrary, it resembles hunger, though not identical with it. Furthermore, the aspect of appetite does not appear immediately upon the inhibition of hunger by food, but after a short interval.

Finally, we may point out that confusion would often be avoided if the physiologist were to distinguish between the attitude that, as biological meaning, appears unitary, and the psychological sensation which is an observational element. Unitariness of the former may be correlated with complexity in the psychological sphere, and there is no reason to assume that every biologically simple experience has its corresponding single sensation or afferent process.